

# User Manual

**Tektronix**

## **PRISM 32PA Performance Analysis Software 070-8494-00**

Please check for change information at the rear of this manual.

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## Preface: A GUIDE TO PRISM DOCUMENTATION

PRISM documentation consists of a number of different manuals. These manuals provide the information necessary to install, operate, maintain, and service the PRISM mainframe and associated application modules.

The PRISM documentation consists of the following:

- The **system user manual**, which includes a basic introduction to operating the PRISM mainframe, how to use the PRISM system-level menus, and reference information such as procedures to connect external devices, specifications, and a glossary of terms.
- **Online documentation** that consists of notes that explain specific menu functions.
- **Application module user manuals** that explain how to use the PRISM application modules.
- **Application software user manuals** that describe the application software packages that can be used with the application modules.
- **Mnemonic disassembly instruction manuals** that explain how to use the microprocessor support products that allow you to disassemble microprocessor signals into their assembly language equivalents.
- **Prototype debug tool user manuals** that describe how to use the debug tools to troubleshoot and integrate software and hardware on your microprocessor-based prototype.
- **Service manuals** that help qualified technicians maintain, troubleshoot, and repair PRISM mainframes and application modules. These manuals also contain procedures for performing incoming inspections, verifying performance specifications, and making system adjustments.

## HOW TO USE THIS MANUAL

This manual describes how to use the 32PA Performance Analysis software for the PRISM system. This manual assumes that you are familiar with the basic operation of the PRISM system, especially the Setup menu of the GPX module. This manual is organized as follows:

- **Section 1: An Overview of PA.** Summarizes the use of the Performance Analysis software and briefly explains the differences between real-time and statistical sampling.
- **Section 2: Getting Started.** Outlines the steps used to set up PA, make an acquisition, and analyze your data.
- **Section 3: State Overview.** Explains how to use PA's State Overview to see a broad overview of the activity in your system under test.
- **Section 4: Time - Real Time Overview.** Describes how to use a timer to study system activity in Time - Real Time Overview.
- **Section 5: Count - Real Time Overview.** Describes how to use a counter to study system activity in Count - Real Time Overview.
- **Section 6: Single Event.** Explains how to program counters or timers to measure specific software events with PA's Single Event.



## GENERAL SAFETY SUMMARY

The general safety information in this summary is for operating and servicing personnel. Specific warnings and cautions can be found throughout the manual where they apply and may not appear in this summary.

### CAUTION

#### TERMS IN THIS MANUAL

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

### WARNING

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

#### TERMS AS MARKED ON EQUIPMENT

CAUTION indicates a hazard to property, including the equipment itself, and could cause minor personal injury.

WARNING indicates a personal injury hazard not immediately accessible as you read the marking.

DANGER indicates a personal injury hazard immediately accessible as you read the marking.

#### SYMBOLS AS MARKED ON EQUIPMENT



DANGER—High voltage.



Protective ground (earth) terminal.



ATTENTION—REFER TO MANUAL.

#### GROUNDING THE PRODUCT

This product is intended to operate from a power source that does not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground.

**WARNING:** This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle. A protective-ground connection by way of the grounding conductor in the power cord is essential for safe operation. (I.E.C. Safety Class I)

#### DANGER ARISING FROM LOSS OF GROUND

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulated) can cause an electric shock.

## **POWER DISCONNECT**

The main power disconnect is by means of the power cord or, if provided, an ac power switch.

## **USE THE PROPER POWER CORD**

Use only the power cord and connector specified for your product. Use only a power cord that is in good condition. CSA Certification includes the equipment and power cords appropriate for use on the North America power network. All other power cords supplied are approved for the country of use.

## **USE THE PROPER FUSE**

To avoid fire hazard use only a fuse of the correct type, voltage rating, and current rating.

## **USE THE PROPER VOLTAGE SETTING**

Make sure the line selector is in the proper position for the power source being used.

## **REMOVE LOOSE OBJECTS**

During disassembly or installation procedures, screws or other small objects may fall to the bottom of the mainframe. To avoid shorting out the power supply, do not power up the instrument until you remove these objects.

## **DO NOT OPERATE WITHOUT COVERS**

To avoid personal injury or damage to the product, do not operate this product without the covers or panels.

## **USE CARE WITH COVERS REMOVED**

To avoid personal injury, remove jewelry, such as rings, watches, and other metallic objects, before removing the cover. Do not touch exposed connections and components within the product while the power cord is connected.

## **REMOVE FROM OPERATION**

If you have reason to believe that the instrument has suffered a component failure, do not operate the instrument until the cause of the failure has been corrected.

## **DO NOT OPERATE IN EXPLOSIVE ATMOSPHERES**

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

## Section 1: AN OVERVIEW OF PA

The PRISM Performance Analysis (PA) application evaluates the software performance of microprocessor-based systems. This manual discusses Performance Analysis for the PRISM 32GPX Acquisition Module; refer to the *PRISM DA01 Performance Analysis Software User Manual* if you are using an MPX Acquisition Module.

Performance Analysis software processes raw data from a system under test (SUT) into a form that provides meaningful information about the system's performance. For the PRISM system, the raw data consists of data acquired from the address lines of a microprocessor-based system. PA then sorts this data into user-defined ranges and displays a bar chart and table of the results. You can display overall system activity, the number of times a routine executes, or the amount of time the system spends in user-defined regions. This shows where your system under test is spending (or wasting) time, so you can then optimize your system by refining the code that is executed the most.

### OPTIMIZING CODE WITH PA

Performance Analysis is the most effective means of identifying inefficient code that can be optimized. Using the PRISM Performance Analysis application, you can perform the following optimization tasks:

- Record events as they occur in the system under test
- Statistically analyze the activity of the system under test in real time to identify inefficient routines
- Determine execution times and monitor their effects
- Analyze memory use
- Observe the bus efficiency of program instructions
- Monitor the effects of interrupts
- Count the occurrences or duration of a software event

## PA AND YOUR OPTIMIZATION STRATEGY

PA is a flexible analysis tool whose use varies with your application. PA offers two ways to analyze your system under test: real-time and statistical sampling.

### Real-Time Sampling

Real-time sampling acquires every data sample, processes it in the background, and displays the activity level of your system under test.

Since real-time sampling captures every sample, no data is missed. This is helpful for capturing infrequent or intermittent activities; these activities do not occur frequently enough to show up in the statistical sampling averages.

PA has two real-time configurations: Time - Real Time Overview and Count - Real Time Overview. In Time - Real Time Overview, you assign a timer for each range (up to 12 ranges are allowed). PA then displays the amount of time your software executes inside each range. In Count - Real Time Overview, you assign a counter for each range (up to 12 ranges are allowed). PA then displays the number of times your software executes inside each range.

Real Time Overview does not use trigger setup information. Instead, you define a word recognizer to prequalify data for each channel group in PA. Qualified data is then sent to the range recognizers for processing.

When studying your system-under-test's performance, you can start with Real Time Overview to get a broad overview of system activity. Since you are observing the system in real time, you will see an accurate representation of overall range activity, including interrupts that may be difficult to measure otherwise. Next, you can use the qualification word recognizer in Real Time Overview to concentrate on specific activities.

## Statistical Sampling

Statistical sampling is a batch operation, since it fills the acquisition memory with data that was qualified by the PRISM trigger setup, processes this data, then combines the new results with any existing results.

Statistical sampling stops acquiring data when it processes data, so it is possible to miss an event that you are studying.

Therefore, statistical sampling is best used for repetitive events. As you acquire more data, the results stabilize and the sampling error decreases; these results approach the results you would get with real-time sampling.

PA's State Overview and Single Event menus use statistical sampling. State Overview shows the activity levels of your system under test in up to 16 ranges. You can use the PRISM trigger setup features (such as word recognition, conditional triggering, and clocking) to specify which data to acquire. State Overview is the default configuration.

The counters and timers in Single Event measure the performance characteristics of a specific event. Single Event uses the PRISM trigger setup to program a timer or counter for your analysis. You can set up the PRISM system to do the following:

- Wait for a specific event to occur (such as the execution of a wait loop)
- Count or time the event
- Display the data graphically in up to 16 ranges

For example, you could use Single Event to measure the amount of time an exception handler spends handling errors. You would use a timer and define your ranges to represent varying lengths of time. If you have one range representing 10 to 20 ms, the results would show the number of times the exception handler took 10-20 ms to complete its task. The results also include the average amount of time to complete execution, as well as the shortest and longest execution times.

Table 1-1 summarizes PA's four menus.

**Table 1-1**  
**PA's Configurations**

<b>Features</b>	<b>Time – Real Time Overview</b>	<b>Count – Real Time Overview</b>	<b>State Overview</b>	<b>Single Event</b>
Fills acquisition memory	No	No	Yes	Yes
Uses PRISM trigger setup	No	No	Yes	Yes
Maximum ranges	12	12	16	16
Maximum counters/timers	12	12	N/A	2 (used individually)

All PA menus have the following features that aid in defining ranges:

- The auto-scale feature is a quick way to define ranges that span the entire spectrum of address activity.
- Symbols can be used to set up PA, so you don't have to type in all of the range information. You can download symbols from application software to the PRISM mainframe.

## Section 2: GETTING STARTED

To use PA, follow these general steps:

**Step 1: Setting Up PRISM.** Connect to your system under test and then define symbols, channel groups, clocking, trigger setup, and PA ranges.

**Step 2: Acquiring Data.** Enter one of PA's menus and acquire data from the system under test.

**Step 3: Analyzing Data.** Analyze the data displayed by PA. This data takes the form of bar charts and tables.

This section discusses each of these steps in more detail.

### STEP 1: SETTING UP PRISM

In order for PA to function, you need to set up the PRISM system correctly. There are both hardware and software considerations.

#### NOTE

*To change the value of a field, you can use pop-up menus, the SELECT knob, or the SELECT keys.*

*To open a pop-up menu, move the cursor to the field using the CURSOR keys and press Return. Use the SELECT knob or keys to highlight a new selection, then press Return to close the pop-up menu.*

*To get online help for any field in the PA menus, move the cursor to the field and press the Notes key.*

### Connecting the System Under Test

You need the following hardware to connect the PRISM system to your system under test:

- A PRISM system with a GPX board (you can use two GPX modules and operate them as a 160-channel module)
- A P6490 General Purpose Probe, connected to the PRISM mainframe
- A probe adapter, connected to the probe and the system under test

Before making any connections, turn off the power to the PRISM system and your system under test. For details on making these connections, refer to the *32GPX Acquisition Module User Manual*.

### Installing Software

If you have not yet installed the Performance Analysis software on your system, use the following steps to install it.

1. To install PA from a floppy disk:
  - a. Insert the PA disk in the PRISM floppy drive.
  - b. Press the Util key and select the Disk Services menu.
  - c. Select the Install Software operation.
  - d. Press the F1: Execute Command function key to execute the install operation.

The Install Software operation places the PA software in the Support directory, so PA will load automatically when the system boots. If you do not want PA to load automatically, use the Copy File operation to move the GPX\_PA file to another directory.

HARD: PERFANAL/GPX\_PA

2. To load PA manually: (You do not need to load PA if it has already been loaded automatically.)
  - a. Press the Util key and select the Save/Restore menu.
  - b. Select the Load Application operation.
  - c. Select GPX\_PA in the File field.
  - d. Select GPX1 or GPX2 (if you have two GPX modules) in the Module field.
  - e. Press F1: Execute Command to execute the load operation.
  - f. Repeat steps a-e for each GPX module.

### Configuring Software

After loading the software, you must configure it. Since the GPX module accumulates the data for PA, many of the setup tasks take place in the PRISM system, outside of PA. Figure 2-1 summarizes the PRISM setup tasks, organized by menu, that are required by PA.



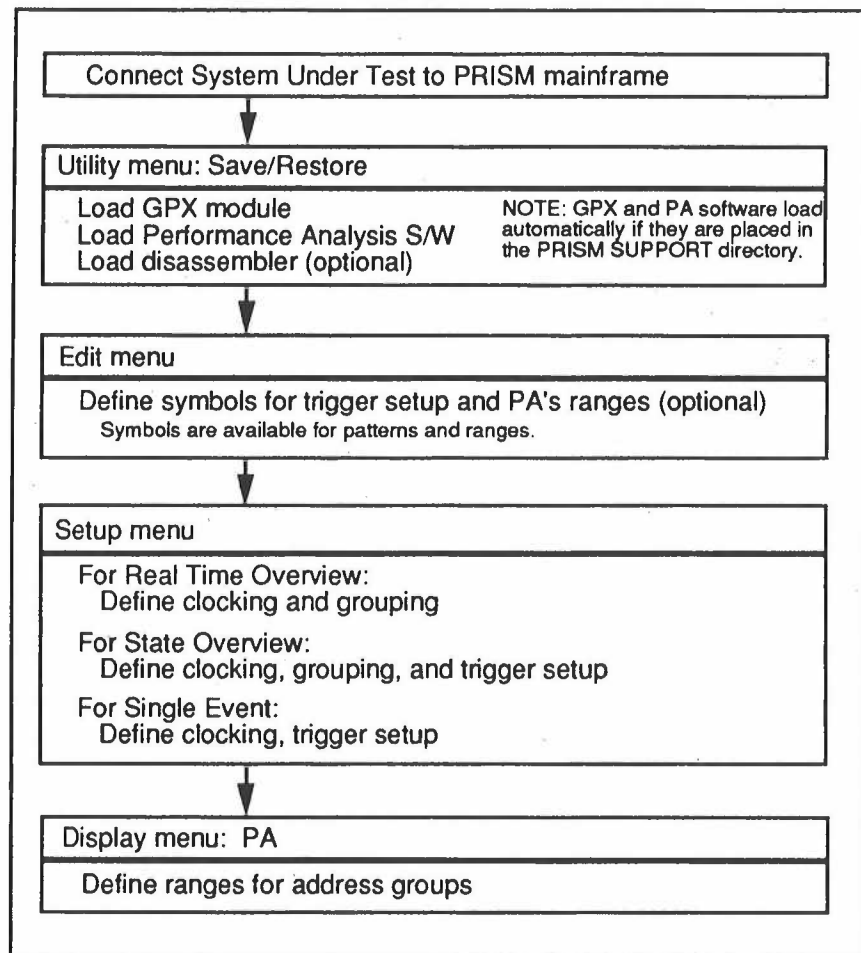


Figure 2-1. Performance Analysis setup in the PRISM system.

### Edit Menu: Symbol Definition

The Edit menu lets you define character strings (or symbols) for use in other setup tasks. Symbols provide meaningful information about what they represent. They are easier to remember and enter, so they simplify setup. Symbols are optional, so they are not required for PA to work.

For example, you could define the symbol WRITE to represent the hexadecimal string that causes the system under test to write to a memory location. Then you could simply use the WRITE symbol in the Setup menu if you want to trigger on a write operation.

VCA: XCURINT for 5.0.3.0  
Stored in PERANAL/XCURIS03,  
9 Sep 94 by Phil R

Symbols can represent a single value or a range of values. Use PATTERN as the radix to use symbols for channel group values or word recognizers used in trigger specifications. Use RANGE as the radix to use symbols for lower and upper range bounds.

Some application software and disassemblers automatically define symbols. To load a symbol table, use the Restore Symbols operation in the Save/Restore Utility menu. To load a range symbol file from application software such as LALINK, use the Convert & Restore Ranges operation in the Save/Restore Utility menu. You can then view or change these symbols in the Symbol Definition menu.

For more details on defining symbols, refer to the *PRISM System User Manual*.

### Setup Menu: Time Base Acquisition Mode

#### NOTE

*To access the GPX Setup menu, press the Setup key, then select the General Purpose Analysis menu for the desired GPX module.*

All of PA's menus require you to define the acquisition mode, which determines when the input channels sample data. The following acquisition modes are available:

- Synchronous mode samples data based on the system-under-test's clock. You use the Synchronous Clocking submenu to set the synchronous clocking parameters.
- Multiple-phase clocking samples data in two phases. It basically works like two synchronous clocks. To set up this mode, press the Multiple Phase function key from the Synchronous Clocking submenu. The demultiplexing option separates data that occurs on the same line at different times. You can use multi-phase clocking to acquire data from multiplexed lines or from separate lines with alternating clocks.

- Transitional mode uses asynchronous clocking to sample data every 10 ns, but stores data only when the value of a channel changes. You can specify which channels cause a sample to be stored using the Global Storage submenu.
- High Resolution mode uses asynchronous clocking to sample data at 1 GS/s. (This mode is valid with only the counters and timers used in the Single Event menu.)
- If you installed a microprocessor disassembler, you will have additional acquisition modes for custom clocking. Use the Clocking Options submenu to select the clocking parameters.

You can determine which samples are stored using the Global Storage submenu. In this submenu, you can define a test that stores data if the test conditions are satisfied. For the transitional mode, you can specify which channels cause a sample to be stored.

For more information on acquisition modes, clocking, and global storage, refer to the *32GPX Acquisition Module User Manual*.

### Setup Menu: Channel Grouping

The GPX module has 80 input channels, each acquiring a signal from the system under test. Channel grouping lets you organize this information into meaningful groups. You can select the radices for these groups.

Performance Analysis needs a valid range group with the following characteristics:

- The group contains Section A0, Channel 0.
- The channels (from 1 to 32) are in sequential order with the last channel in the group being A00.
- The group is assigned to Time Base A.

The PRISM system defines default channel groups automatically. If more than one valid range group is defined, PA uses the first valid group in the list; PA recognizes two range groups for 160-channel modules (modules with two boards). If a valid range group is not defined, then you can quickly create a default group using the Add Range Group function key.

State Overview and Real Time Overview use the channel grouping information. For more information on defining channel groups, refer to the *32GPX Acquisition Module User Manual*.

### Setup Menu: Trigger Specification

The trigger setup lets you define tests for the data from your system under test. These tests consist of conditions and actions: when the conditions are satisfied, the PRISM system performs the actions. Statistical sampling, used in State Overview and Single Event, requires a trigger setup.

The PRISM system has two ways to specify triggering: Trigger Applications and Programmable Trigger.

- The Trigger Applications mode lets you choose a trigger setup that is already programmed in the system. Then you only have to enter specific parameters used by this setup.
- The Programmable Trigger mode lets you start with a programmed trigger application. You can then customize this setup by adding, removing, or modifying the conditions, actions, tests, and states.

You can combine multiple conditions and actions to develop very complex qualifications for your data. There are four types of conditions:

- A specific event defined by a word recognizer composed of any of the channel groups defined in the channel grouping
- The time of an event or the time between events (timer)
- The number of times an event occurs (counter)
- A signal from another application module

The PRISM system gives default names to your conditions and numbers them starting with zero. You can then change these numbers to more meaningful names. You can change the radix of a word-recognizer condition with the Change Radix function key.

Actions consist of triggering, storing data, branching, and controlling timers, counters, and signals. Tests combine conditions and actions using If (Not), Else If (Not), and Else logic statements. You can include multiple conditions in a test using AND and OR operators. Finally, you can combine tests to form states. Only one state controls the GPX module at any time. You can switch the active state using the Go To State action.

Figure 2-2 and Figure 2-3 show an example of the same trigger setup using both trigger modes. Figure 2-2 uses the Trigger Applications mode and Figure 2-3 uses the Programmable Trigger mode.

```

===== SETUP: GPX1: GENERAL PURPOSE ANALYSIS IS =====
Trigger Applications                                     Module Width: 80 channels
18 Measure time from Sample 0 to Sample 1, then trigger [State]

Time Base A: 68000                                     Initial Storage: On
Time Base B: Off
Trigger Location: [          T          ]

Trigger Specification
-----
Measure time from
    HEX      HEX      HEX      HEX      HEX
    Address Data Control Intr Misc
Sample 0 equal to: 0052AE XXXX XXXX X X

To
    Address Data Control Intr Misc
Sample 1 equal to: 0052BB XXXX XXXX X X

Then trigger

The time measurement is displayed in the Auxiliary Data Display submenu.
Example
=====
                Sample 0                Sample 1
=====X=====X=====X=====X=====
                |-----|
                | Measure Time |
                |-----|
                        ▲ Trigger
=====
F1      F4      F5      F6      F7      F8
Load From Clocking Change Channel Global Split
Cursor   Options Radix Grouping Storage Display
  
```

Figure 2-2. Trigger Applications mode.

SETUP: GPX1: GENERAL PURPOSE ANALYSIS																									
Programmable Trigger																									
Module Width: 80 channels																									
Time Base A: 68000	Initial Storage: On																								
Time Base B: Off																									
Trigger Location: [ T ]																									
Trigger Specification																									
State 0																									
If	<table border="1"> <thead> <tr> <th>Sample</th> <th>=</th> <th>Word Recognizer</th> <th># 0</th> <th>Test 0</th> </tr> <tr> <th>HEX</th> <th>HEX</th> <th>HEX</th> <th>HEX</th> <th>HEX</th> </tr> <tr> <th>Address</th> <th>Data</th> <th>Control</th> <th>Intr</th> <th>Misc</th> </tr> </thead> <tbody> <tr> <td>0052AE</td> <td>XXXX</td> <td>XXXX</td> <td>X</td> <td>X</td> </tr> </tbody> </table>	Sample	=	Word Recognizer	# 0	Test 0	HEX	HEX	HEX	HEX	HEX	Address	Data	Control	Intr	Misc	0052AE	XXXX	XXXX	X	X				
Sample	=	Word Recognizer	# 0	Test 0																					
HEX	HEX	HEX	HEX	HEX																					
Address	Data	Control	Intr	Misc																					
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Figure 2-3. Programmable Trigger mode.

This example shows a two-state setup that triggers the system to acquire data. Two hexadecimal word recognizers and a timer are defined.

- **State 0, Test 0, Word Recognizer #0.** A hexadecimal word recognizer detects when the execution of a routine begins. Don't Cares (XXXX) are used in the word recognizer where you don't need an exact match. This condition uses the condition test symbol =, so when the data matches the value of the word recognizer, the condition is true.
- **State 1, Test 1, Word Recognizer #1.** A hexadecimal word recognizer detects when the last instruction of the routine executes.
- **Timer 0.** A timer monitors the execution time of the routine. The actions that you define in the trigger states start and stop the timer.

In this example, when the first condition occurs, the second state becomes active. When the second condition is true, the system triggers. The timer starts when the first condition is true and stops when the second condition is true. When using this trigger setup with PA, Single Event counts the number of times the timer falls inside the defined ranges for each sample. Since these results will vary for each sample, Single Event also records the minimum, maximum, and average amount of time for this event to execute.

In most cases, you will initially enter Don't Cares (XXXXXX) in your word-recognizer conditions so data will be acquired. After you analyze the overall system performance, you can enter more specific information in the trigger setup to pinpoint your study.

For more information on trigger setup, refer to the *32GPX Acquisition Module User Manual*.

#### NOTE

*You must set the Trigger Specification field in the Setup menu to either Trigger Applications or Programmable Trigger. If this field is set to OFF, PA will be disabled.*

#### Performance Analysis: Define Ranges Submenu

All of PA's menus require you to define ranges. For State Overview and Real Time Overview, you define ranges of the code to pinpoint the sections of code that you want to examine in detail. For Single Event, you define ranges for the timers and counters, such as lengths of time for timers and number of occurrences for counters. PA then displays the activity for each of these ranges. Range definitions do not need to be unique; you can overlap ranges or define duplicate ranges. In this case, PA increments the occurrences for each valid range.

State Overview and Real Time Overview share range definitions. When you modify range definitions in one menu, a new set of range definitions is created in the other menus. However, because Real Time Overview and State Overview support a different number of ranges, it can make a difference where you modify the range definition. Modifying a range definition in Real Time Overview results in a maximum of 12 defined ranges in either Real Time or State Overview. Modifying a range definition in State Overview results in a maximum of 16 defined ranges in State Overview, but Real Time Overview uses only the first 12 of those ranges.

### NOTE

*To access PA, press the PRISM Dspl menu key, then select the Performance Analysis application for the desired module.*

*To display the Define Ranges submenu, press F5: Define Ranges. To exit the Define Ranges submenu, press F8: Exit Submenu.*

The auto-scale feature in the Define Ranges submenu can quickly focus on an area for investigation. You specify the total range and the number of ranges, instead of specifying the beginning and ending of each range.

You can use ranges defined by a software application, such as LALINK, by selecting the RANGE symbolic radix and downloading the defined range symbols.

## STEP 2: ACQUIRING DATA

PA analyzes your system under test in four ways: Time – Real Time Overview, Count – Real Time Overview, State Overview, and Single Event. To display a menu, select it in the **Configured for field**.

PA has two function keys that control sampling, Begin Sampling and Continue Sampling. Begin Sampling initializes counters, timers, and data. Continue Sampling adds new data to existing data. Press these function keys again to stop sampling. For State Overview and Single Event, the number of acquisitions is shown in the Number of Acquisitions field.

If you have multiple GPX modules, you can synchronize data acquisition between these modules with the Start All GPX Modules switch. This feature ensures that the sampling for each module starts at exactly the same time. When you start or continue sampling for the displayed module, the synchronized module(s) will also start or continue sampling. You can control sampling from any module. Synchronized modules must operate in compatible sampling configurations (statistical versus real time). State Overview is compatible with Single Event, and Time – Real Time Overview is compatible with Count – Real Time Overview. You can use up to four GPX modules to monitor the same processor; this setup provides up to 48 (4 x 12) real-time ranges or 64 (4 x 16) statistical ranges.



### STEP 3: ANALYZING DATA

Figure 2-4 shows the general information that you will see on each PA display.

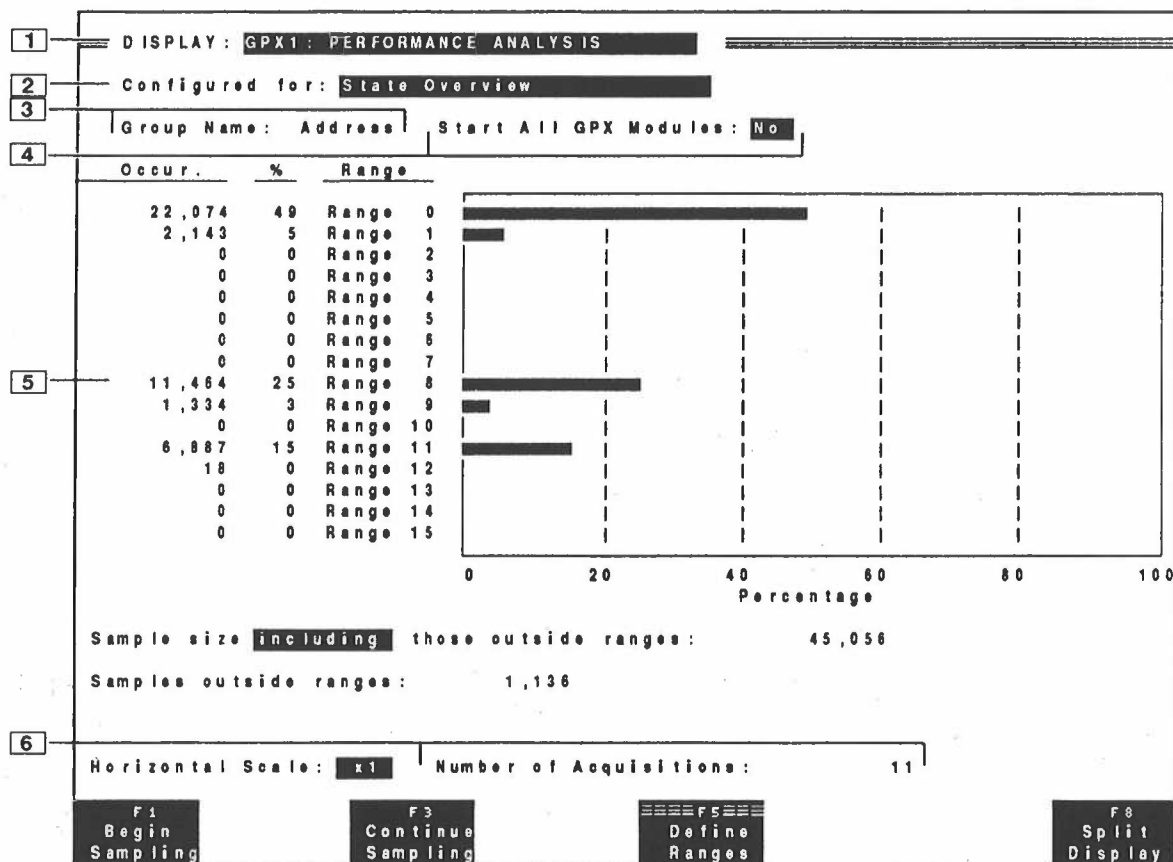


Figure 2-4. Performance Analysis display.

- 1** **Display.** Indicates the module slot. Figure 2-4 shows that the Performance Analysis application uses the first GPX slot.
- 2** **Configured for.** Indicates the PA menu (State Overview, Single Event, Time – Real Time Overview, or Count – Real Time Overview). You can change this field.
- 3** **Group Name.** Indicates which address channel group you specified when you set up the ranges.

## Getting Started

- 4 Start All GPX Modules.** Indicates if multiple GPX modules are sampling data at the same time.
- 5 Table and Bar Chart.** Graphically and statistically displays the activity in the defined ranges.
- 6 Number of Acquisitions.** Displays the number of data acquisitions that have been completed.

## Section 3: STATE OVERVIEW

State Overview repeatedly acquires and processes data using the following batch technique:

1. The PRISM system tests the data to ensure that it passes the tests that you defined in the trigger setup.
2. Upon finding valid data, the PRISM system fills the acquisition memory.
3. State Overview then processes this data. Each time an acquisition occurs within a range of address lines that you defined, PA increments the counter for that range. State Overview adds the new results to any existing data.
4. The State Overview menu displays these combined results. A table and bar chart show the activity within the user-defined ranges for your system under test.

State Overview is a statistical PA, since it displays the activity for many acquisition samples. Since you may not capture all samples, it is possible to miss an event that you want to study. Therefore, State Overview is best used for studying repetitive events, so you can build a good sample through repetitive measurements.

This is the default PA menu.

### USES OF STATE OVERVIEW

You will use State Overview to study the activity of your whole system. If you observe unexpected activity in a range (for example, too little or too much activity), then you can investigate this range in more detail with PA's other menus.

For example, you could use the auto-scale feature (described later in this section) to quickly create a series of ranges that spans an address group. State Overview then produces a bar chart and numeric display showing the absolute and relative time spent in the address ranges. State Overview's results would help you determine if a particular routine executes too frequently and slows overall performance.

## SETTING UP STATE OVERVIEW

Figure 3-1 shows the steps used to set up State Overview. Steps 1-4 are discussed in more detail in Section 2 and Step 5 is discussed in more detail in the remainder of this section.

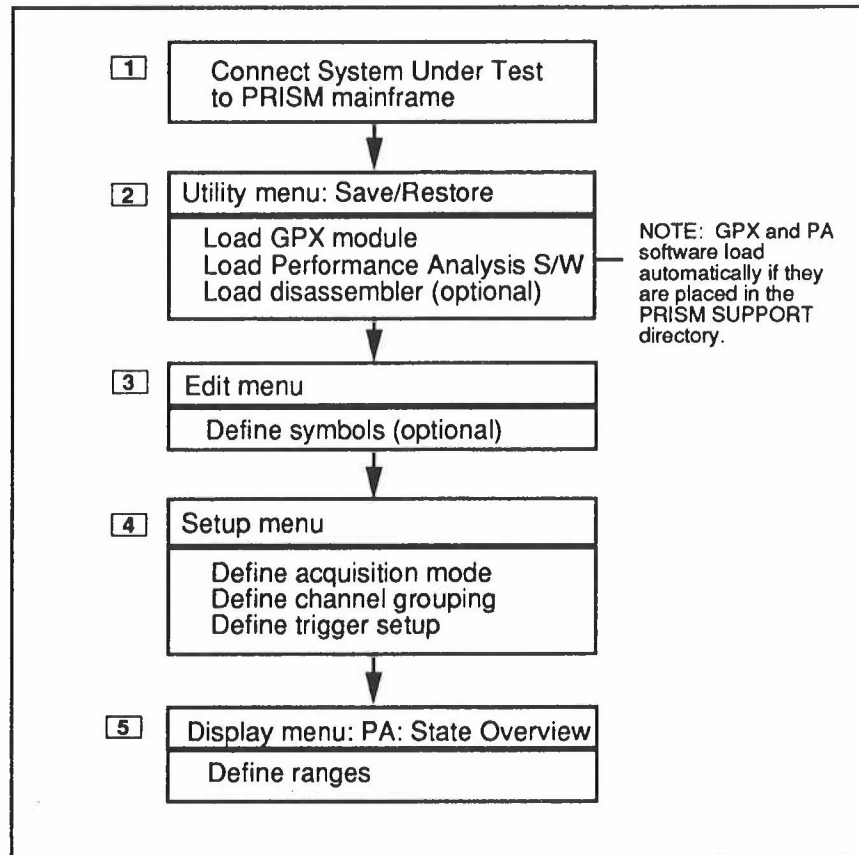


Figure 3-1. State Overview setup steps.

- 1 Connect to your system under test.** You connect the PRISM system to your system under test with a probe and probe adapter. For details on making your connections, refer to the *32GPX Acquisition Module User Manual* and your microprocessor support instruction manual.
- 2 Load the required software.** You must load the GPX and GPX\_PA software for the PRISM system to work; separate GPX\_PA software should be loaded for each GPX module. You can also load a disassembler; this simplifies setup, since the disassembler automatically defines clocking, grouping, symbols, and triggering. The PA and GPX software load automatically if you place them in the SUPPORT directory.

- 3 **Define symbols.** You have the option of using the Edit menu to assign meaningful names to range bounds or word recognizers used in trigger specifications. You can then use these symbols in other setup steps, thereby simplifying these tasks. Application software and disassemblers automatically define some symbols. For details on defining symbols, refer to the *PRISM System User Manual*.
- 4 **Set up the GPX.** You define the acquisition mode, channel groups, and triggering in the GPX Setup menu. For general information on using the Setup menu, refer to the *32GPX Acquisition Module User Manual*.
- 5 **Define ranges in State Overview.** In PA's State Overview menu, you set up the ranges that you want to study in the Define Ranges submenu, start the acquisition, and display the resulting execution activity for the ranges.

## Defining Ranges

State Overview counts the occurrences of user-defined conditions in sections of code. You use the Define Ranges submenu to define these sections of code, or ranges, for the channel groups. This allows you to organize PA's results into meaningful information.

State Overview and Real Time Overview share range definitions. When you modify range definitions in one menu, a new set of range definitions is created in the other menus. Since these menus support a different number of ranges, Real Time Overview will use a subset of the ranges when you define more than 12 ranges in State Overview. For example, if State Overview uses 16 ranges, then Real Time Overview uses only the first 12 of those ranges.

Follow these steps to display the Define Ranges submenu:

1. Display PA by pressing the Dspl key and then selecting the Performance Analysis application for the desired module in the DISPLAY field.
2. If the State Overview menu is not displayed, select State Overview in the **Configured for** field.
3. Press F5: Define Ranges to display the Define Ranges submenu. (Refer to Figure 3-2.)

### NOTE

*To access this submenu, you must define a valid range address group.*

DISPLAY: GPX1: PERFORMANCE ANALYSIS

Configured for: State Overview

Group Name: Address Start All GPX Modules: No

Define Ranges

1 Group Name: Address

2 Number of Ranges to be Auto Scaled: 8

3 Bounds Radix: HEX

4 Bounds: Absolute

LOWER BOUND		RANGE NAME		UPPER BOUND
000000	<=	Range 0	<=	1FFFFFF
200000	<=	Range 1	<=	3FFFFFF
400000	<=	Range 2	<=	5FFFFFF
600000	<=	Range 3	<=	7FFFFFF
800000	<=	Range 4	<=	9FFFFFF
A00000	<=	Range 5	<=	BFFFFFF
C00000	<=	Range 6	<=	DFFFFFF
E00000	<=	Range 7	<=	FFFFFFF

F1 Undo All Changes F2 Add Range F3 Delete Range F4 Set to Defaults F7 Auto Scale F8 Exit Submenu

Figure 3-2. Define Ranges submenu in State Overview.

- 1 **Group Name.** Use this field to select the name of the group whose ranges you need to enter. You can select from range groups that you set up in the Channel Grouping submenu of the 32GPX Setup menu or from those automatically created when you load a disassembler. There are restrictions on the address groups that PA will use (refer to Section 2 for these restrictions).
- 2 **Number of Ranges to be Auto Scaled.** Auto scaling is a quick method of defining ranges. You can specify the number of ranges to be auto scaled. The options are 1, 2, 4, 8, or 16. This feature is explained later in this section.
- 3 **Bounds Radix.** You can select from a list of possible formats for the range bounds. Your choices are Hexadecimal, Octal, Binary, Pattern, and Range. If you want to use values that you defined with the Symbol Editor, use the Pattern or Range radix.

- [4] **Bounds.** The default value, Absolute, does not modify the range bounds. If you select Relative in this field, a user-defined offset is added to your ranges, so they represent the address ranges where the code will actually execute. You define this offset in the Base field in the Define Ranges submenu for numeric radices or the Base Offset field in the Symbol Definition Edit menu for symbolic radices. (If the offset plus the beginning range is greater than the maximum range, an error occurs.)
- [5] **Lower Bound, Range Name, Upper Bound.** These fields show the minimum and maximum values that define a range. Default range names are numbered, starting with zero, but you can change them in this menu. Use the Range radix to define the range bounds with symbols; this radix displays a range name and one bounds field containing the lower and upper bounds. Use the CURSOR keys to scroll to ranges that do not fit on the display.

### Function Keys

- F1: Undo All Changes.** This key erases all changes made since displaying the Define Ranges submenu. It returns the menu to the original settings that existed when you entered the menu.
- F2: Add Range.** This key adds a range to your group. The maximum number of ranges in State Overview is 16.
- F3: Delete Range.** This key removes the selected range from the group.
- F4: Set to Defaults.** This key defines one range for the entire range; the lower bound is set to the lowest possible value and the upper bound is set to the highest possible value. These defaults are defined by the system, and cannot be changed.
- F7: Auto Scale.** This key lets you quickly set up ranges. The upper bound of the last range becomes the largest upper bound of the group, and the other bounds are scaled to fit. See *Auto Scaling Ranges* in this section for more information.
- F8: Exit Submenu.** This key exits the Define Ranges submenu and displays the State Overview menu.

### Auto Scaling Ranges

The auto scale feature is a quick way to zoom in on a range that interests you. Use the following procedure to focus on Range 0 in Figure 3-2 by dividing it into 8 equal ranges.

1. Set the Number of Ranges to be Auto Scaled field to 8.
2. Delete all of the ranges except Range 1 with the F3: Delete Range key.
3. Press F7: Auto Scale.

Figure 3-3 shows the resulting ranges. Notice that the upper bound for Range 0 in Figure 3-2 is now the upper bound for the entire group in Figure 3-3.

DISPLAY: GPX1: PERFORMANCE ANALYSIS			
Configured for: State Overview			
Group Name: Address		Start All GPX Modules: No	
Define Ranges			
Group Name: Address		Number of Ranges to be Auto Scaled: 8	
Bounds Radix: HEX		Bounds: Absolute	
LOWER BOUND		RANGE NAME	UPPER BOUND
000000	<=	Range 0	<= 03FFFF
040000	<=	Range 1	<= 07FFFF
080000	<=	Range 2	<= 0BFFFF
0C0000	<=	Range 3	<= 0FFFFFFF
100000	<=	Range 4	<= 13FFFF
140000	<=	Range 5	<= 17FFFF
180000	<=	Range 6	<= 1BFFFF
1C0000	<=	Range 7	<= 1FFFFFFF

F1 Undo All Changes	F2 Add Range	F3 Delete Range	F4 Set to Defaults	F7 Auto Scale	F8 Exit Submenu
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Figure 3-3. Auto-scaled ranges for Range 0.

Auto scale does not work with Pattern or Range radices.



## MAKING AN ACQUISITION

After you set up State Overview, you are ready to make an acquisition. Figure 3-4 shows the two keys that control acquisition: Begin Sampling and Continue Sampling. Begin Sampling initializes counters, timers, and data, while Continue Sampling adds new data to the existing data.

If you have multiple GPX modules, you can synchronize data acquisition between these modules with the Start All GPX Modules switch. This feature ensures that the sampling for each module starts at exactly the same time. When you start or continue sampling for the displayed module, the synchronized module(s) will also start or continue sampling. You can control sampling from any module. Synchronized modules must operate in compatible sampling configurations (statistical versus real time); State Overview is compatible with Single Event, and the Real Time Overview menus are compatible with each other. This field does not appear on the menu if you have only one GPX module.

Figure 3-4 also shows two fields, Sample Size and Horizontal Scale, that let you adjust how State Overview displays the statistics. You can change these settings before, during, or after your acquisition.

## State Overview

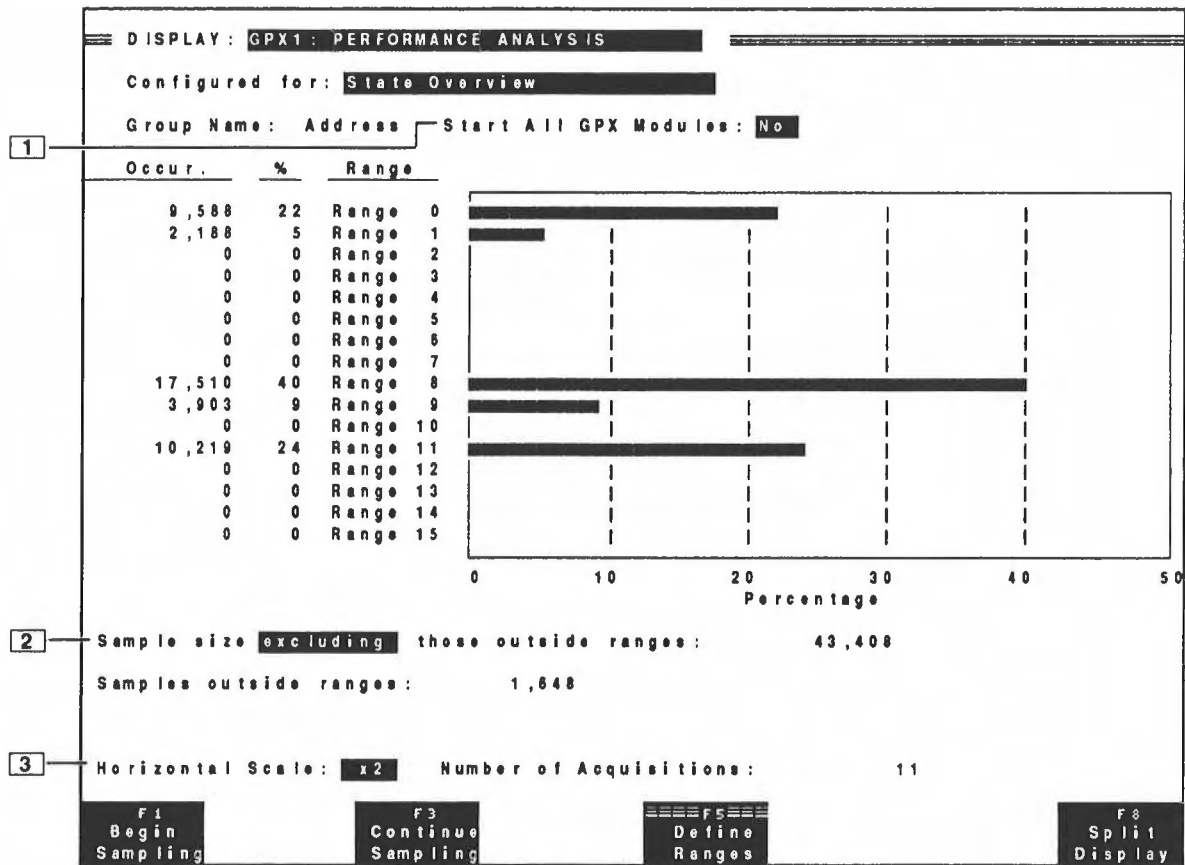


Figure 3-4. State Overview's acquisition-related fields and keys.

- [1] Start All GPX Modules.** This field synchronizes the sampling of all GPX modules.
- [2] Sample size.** If you select **including** in this field, all of the data, including the data outside of the defined range, is calculated into the overall percentages. If you select **excluding**, only the data acquired within the defined ranges is counted in the percentage calculation.
- [3] Horizontal Scale.** This field adjusts the scale of the bar chart's horizontal axis by a defined factor (x1, x2, x5, x10, or x20).

### Function Keys

**F1: Begin Sampling.** Press this key to begin sampling. This initializes all data, counters, and timers. To stop sampling, press it again.

**F3: Continue Sampling.** This key lets you sample on a cumulative basis. Newly acquired data is added to your existing data; existing data is not destroyed. If you change the range definitions, the F3 function key cannot be used until F1 is used.

**F5: Define Ranges.** This key displays the Define Ranges submenu.

**F8: Split Display.** This key splits the window horizontally into two panes, so you can view two menus. After displaying two panes, press Shift-F8 to switch which pane is active or press F8 again to display a single pane.

## ANALYZING THE RESULTS

After you make your acquisition, PA displays a State Overview screen with tabular and graphical statistics about the range activity. Figure 3-5 shows an example of a State Overview display.

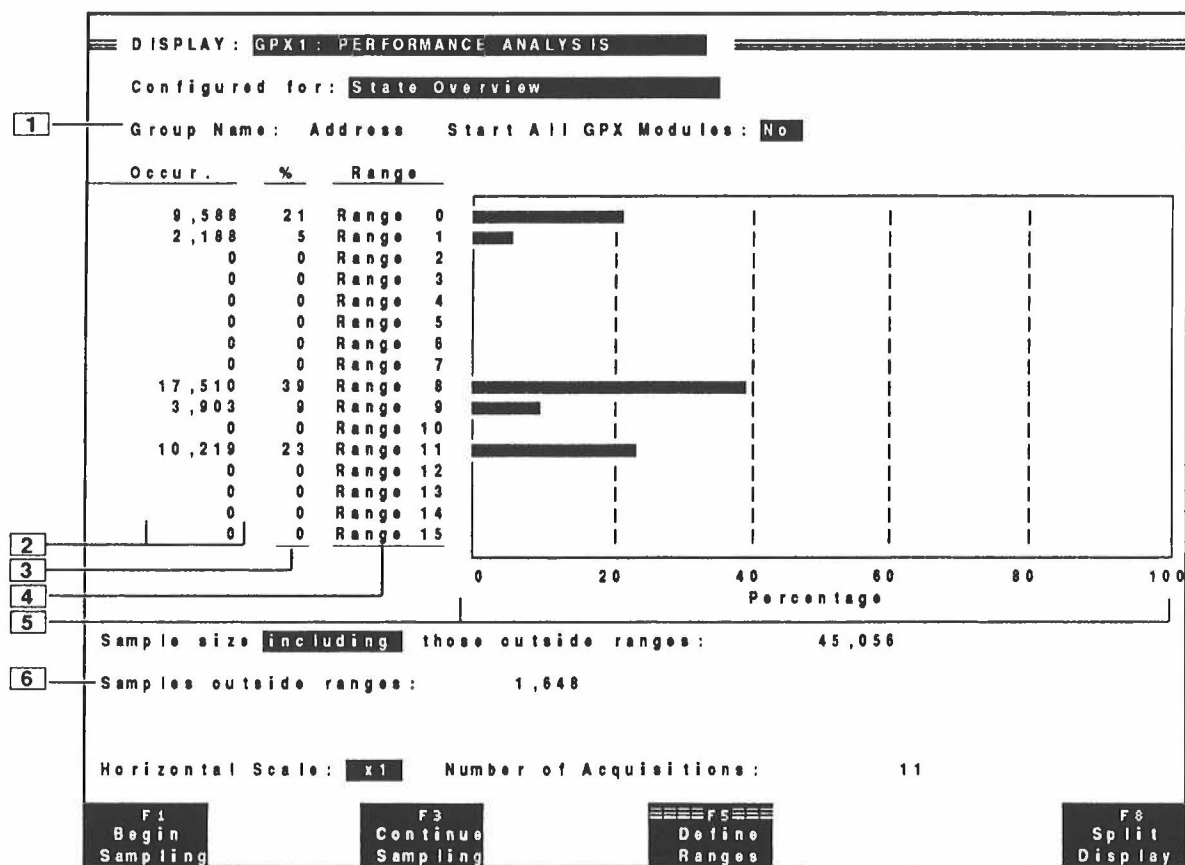


Figure 3-5. The State Overview results.

- 1 Group Name.** This field shows the group name (for example, address) of the displayed performance statistics. You selected the group in the Define Ranges submenu and created it in the PRISM Setup menu.
- 2 Occurrences.** This column indicates the number of times the acquired data was within each range.
- 3 %.** This column shows the number of occurrences, expressed as a percentage of the total samples. You can adjust the sample size to include or exclude data outside of the defined ranges with the sample size field.
- 4 Range.** This column displays the name of the ranges that you defined in the Define Ranges submenu.
- 5 Bar Chart.** The bar chart shows the percentage of occurrences that fell within the range; this is a graph of the data in the % column. This value may vary with the sample size field (excluding or including).
- 6 Samples outside ranges.** This figure indicates the number of samples that fell outside of the defined ranges.

Since most of the execution activity is in Range 8 in Figure 3-5, you can either examine this range further or improve this section of code to make your program more efficient.

## **Section 4: TIME - REAL TIME OVERVIEW**

Time - Real Time Overview displays the execution activity of your system under test in real time. You look at the system activity as the data is acquired; data is processed in the background. You get to see all acquisition samples, so you won't miss infrequent or intermittent events.

Time - Real Time Overview measures the system under test using timers. You define up to 12 ranges, consisting of address channel groups that have been defined, and PA assigns a timer to each range. During acquisition, PA starts the timer whenever the acquired data falls within its associated range. The time spent in the various ranges is dynamically displayed in a bar chart and table. The total time spent in all ranges is shown as well. As you acquire more samples in real time, the new data is combined with the existing results.

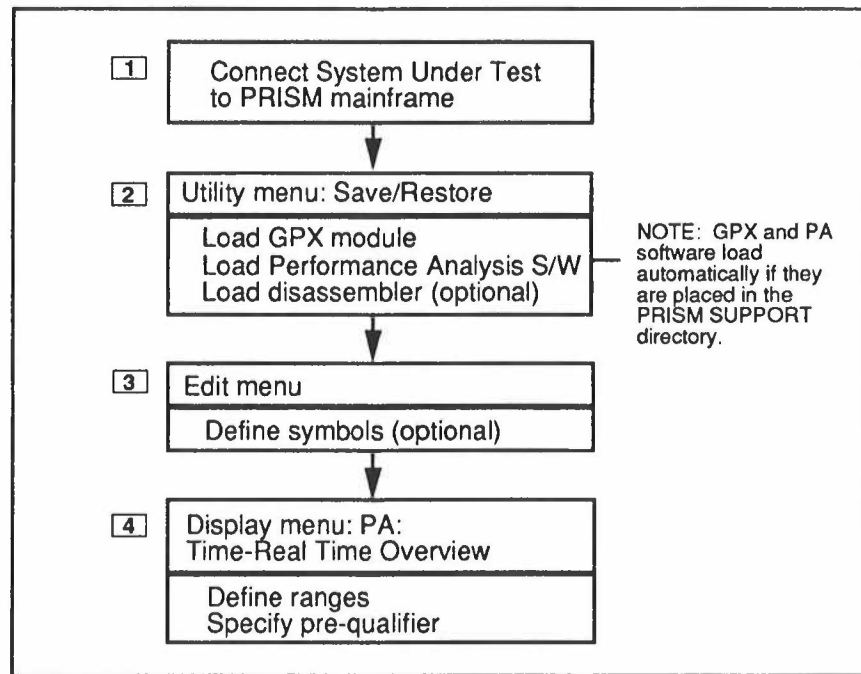
Time - Real Time Overview does not use the PRISM trigger setup, but lets you define a word-recognizer condition to pre-qualify data presented to the defined ranges. The total time displayed in the menu includes all samples that meet this qualification.

### **USES OF TIME - REAL TIME OVERVIEW**

You use Time - Real Time Overview when you want to directly measure the timing characteristics of your system under test as it is handled by the application module. This is useful at the start of your investigation of the system under test, because it lets you see an accurate representation of overall system activity. Since you are observing the system in real time, you can measure events that may be difficult to detect using PA's other menus.

### **SETTING UP TIME - REAL TIME OVERVIEW**

Figure 4-1 shows the steps involved in setting up Time - Real Time Overview. Notice that unlike State Overview and Single Event, you do not create a trigger setup in the PRISM Setup menu. Steps 1-3 are described in more detail in Section 2 and step 4 is described in more detail in the remainder of this section.



**Figure 4-1. Time - Real Time Overview setup steps.**

- 1 Connect to your system under test.** Connect the PRISM system to your system under test with a probe and probe adapter. For details on making your connections, refer to the *32GPX Acquisition Module User Manual* and your microprocessor support instruction manual.
- 2 Load software.** You must load the 32GPX and GPX\_PA software for Time - Real Time Overview to work; separate GPX\_PA software should be loaded for each GPX module. You can also load a disassembler; this simplifies setup, since the disassembler automatically defines clocking, grouping, and symbols. The PA and GPX software load automatically if you place them in the SUPPORT directory.
- 3 Define symbols.** You have the option of using the Edit menu to assign meaningful names to range bounds. You can then use these symbols in other setup steps, thereby simplifying these tasks. Application software and disassemblers automatically define some symbols. For details on defining symbols, refer to the *PRISM System User Manual*.

- 4 Define ranges in Time - Real Time Overview.** In PA's Time - Real Time Overview menu, you set up the ranges that you want to study (in the Define Ranges submenu), then start your acquisition, and display the resulting execution activity for the ranges.

## Defining Ranges

Time - Real Time Overview times the occurrences of user-defined conditions in sections of code. You use the Define Ranges submenu to define these sections of code, or ranges, for the channel groups. This allows you to organize PA's results into meaningful information.

State Overview and Real Time Overview share range definitions. When you modify range definitions in one menu, a new set of range definitions is created in the other menus. Since Real Time Overview and State Overview support a different number of ranges, Real Time Overview uses only the first 12 of the ranges defined in State Overview.

Since Time - Real Time Overview does not use the PRISM trigger setup, the Define Ranges submenu lets you define a word-recognizer qualifier condition that lets you pre-qualify data presented to the defined ranges. If the condition is satisfied, then Time - Real Time Overview accepts the data. This feature is not available for 160-channel modules (using two GPX modules).

Follow these steps to display the Define Ranges submenu:

1. Display PA by pressing the Dspl key and then selecting the Performance Analysis application for the desired module in the DISPLAY field.
2. Select Time - Real Time Overview in the **Configured for** field.
3. Press F5: Define Ranges to display the Define Ranges submenu. (Refer to Figure 4-2 for an example of the Define Ranges submenu.)

### NOTE

*To access this submenu, you must define a valid range address group.*

DISPLAY : GPX1 : PERFORMANCE ANALYSIS

Configured for: Time - Real Time Overview

Group Name: Address Start All GPX Modules: No

Define Ranges

1 Group Name: Address

2 Accept Samples When Word =

3 Bounds Radix: HEX

4 Bounds: Absolute

LOWER BOUND		RANGE NAME		UPPER BOUND
000000	<=	Range 0	<=	155554
155555	<=	Range 1	<=	2AAAAA
2AAAAA	<=	Range 2	<=	3FFFFFF
400000	<=	Range 3	<=	555554
555555	<=	Range 4	<=	6AAAAA
6AAAAA	<=	Range 5	<=	7FFFFFF
800000	<=	Range 6	<=	955554
955555	<=	Range 7	<=	AAAAAA
AAAAAA	<=	Range 8	<=	BFFFFFF
C00000	<=	Range 9	<=	D55554

5

F1 Undo All Changes

F2 Add Range

F3 Delete Range

F4 Set to Defaults

F5 Change Radix

F7 Auto Scale

F8 Exit Submenu

Figure 4-2. Define Ranges submenu in Time - Real Time Overview.

- 1 **Group Name.** Use this field to select the name of the group whose ranges you need to enter. You can select from range groups that you set up in the 32GPX Setup menu's Channel Grouping submenu or from those automatically created when you load a disassembler. There are restrictions on the address groups that PA will use (refer to Section 2 for these restrictions).
- 2 **Accept Samples When Word.** This field shows the test used to pre-qualify data. The test consists of a condition and a word-recognizer qualifier. The condition choices are equal (=) or not equal (!=). You change the format of the word recognizers with the Change Radix function key.
- 3 **Bounds Radix.** You can select from a list of possible formats for the range bounds. Your choices are Hexadecimal, Octal, Binary, Pattern, and Range. If you want to use values that you defined with the Symbol Editor, use the Pattern or Range radix.



- [4] Bounds.** The default value, Absolute, does not modify the range bounds. If you select Relative in this field, a user-defined offset is added to your ranges, so they represent the address ranges where the code will actually execute. You define this offset in the Base field in the Define Ranges submenu for numeric radices or the Base Offset field in the Symbol Definition Edit menu for symbolic radices. (If the offset plus the beginning range is greater than the maximum range, an error occurs.)
- [5] Lower Bound, Range Name, Upper Bound.** These fields show the minimum and maximum values that define a range. The default range names are numbered, starting with zero. You can use these defaults or specify your own names. Use the Range radix to define the range bounds with symbols; this radix displays a range name and one bounds field containing the lower and upper bounds. Use the CURSOR keys to scroll to ranges that do not fit on the display.

### Function Keys

- F1: Undo All Changes.** This key erases all changes made since displaying the Define Ranges submenu. It returns the menu to the original settings that existed when you entered the menu.
- F2: Add Range.** This key adds a range to your group. The maximum number of ranges in Time - Real Time Overview is 12.
- F3: Delete Range.** This key removes the selected range from the group.
- F4: Set to Defaults.** This key defines one range with the lower bound set to the lowest possible value and the upper bound set to the highest possible value. These defaults are defined by the system, and cannot be changed.
- F5: Change Radix.** This key changes the radix of the selected channel group within the word-recognizer field. Therefore, this affects the format of the word recognizer for that group.
- F7: Auto Scale.** This key lets you quickly set up ranges. The upper bound of the range becomes the largest upper bound of the group, and the other bounds are scaled to fit. Time - Real Time Overview automatically defines 12 ranges, you cannot set this parameter. For details on the auto-scale feature, refer to the *Auto Scaling Ranges* in Section 3.

**F8: Exit Submenu.** This key exits the Define Ranges submenu and displays the Time - Real Time Overview menu.

### MAKING AN ACQUISITION

After you finish the setup tasks, you are ready to make your data acquisition.

If you have multiple GPX modules, you can synchronize data acquisition between these modules with the Start All GPX Modules switch. This feature ensures that the sampling for each module starts at exactly the same time. When you start or continue sampling for the displayed module, the synchronized module(s) will also start or continue sampling. You can control sampling from any module. Synchronized modules must operate in compatible sampling configurations (statistical versus real time); State Overview is compatible with Single Event, and Time - Real Time Overview is compatible with Count- Real Time Overview. This field does not appear on the menu if you have only one GPX module.

Figure 4-3 shows the keys and fields that control data acquisition and data display in the Time - Real Time Overview menu. You can change these settings before, during, or after your acquisition.

#### NOTE

*In Real Time Overview, all of the modules in the system are temporarily disabled, except modules included in multiple-module PA sampling. These disabled modules do not participate in the acquisition. This is not true for PA's other menus, Single Event and State Overview.*

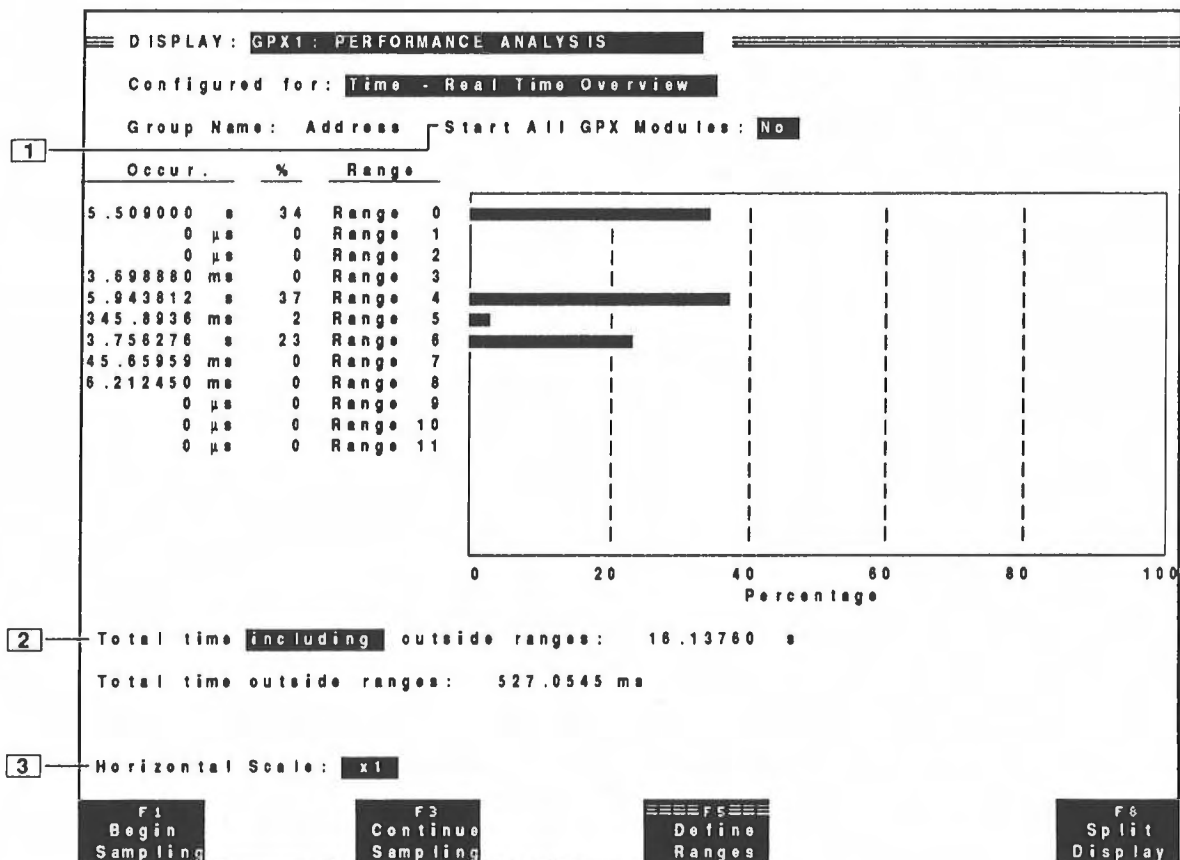


Figure 4-3. Time - Real Time Overview's acquisition-related fields and keys.

- 1 **Start All GPX Modules.** This field synchronizes the sampling of all GPX modules.
- 2 **Total time.** If you select **including** in this field, all of the data, including the data outside of the defined range, is calculated into the overall percentages. If you select **excluding**, only the data acquired within the defined ranges is counted in the percentage calculation.
- 3 **Horizontal Scale.** This field adjusts the scale of the bar chart's horizontal axis by a defined factor (x1, x2, x5, x10, or x20).

### Function Keys

- F1: Begin Sampling.** Press this key to begin sampling. This initializes all data and timers. To stop sampling, press it again.
- F3: Continue Sampling.** This key lets you sample on a cumulative basis. Newly acquired data is added to your existing data; existing data is not destroyed.

## Time - Real Time Overview

**F5: Define Ranges.** This key displays the Define Ranges submenu.

**F8: Split Display.** This key splits the window horizontally into two panes, so you can view two menus. After displaying two panes, press Shift-F8 to switch which pane is active or press F8 again to display a single pane.

## ANALYZING THE RESULTS

As you acquire data, Time - Real Time Overview displays the range activity dynamically. Data is continually redisplayed. Figure 4-4 shows the system-activity information that appears on a Time - Real Time Overview menu.



Figure 4-4. Time - Real Time Overview results.

- 1 Group Name.** This field shows the group name (for example, address) of the displayed performance statistics. You selected the group in the Define Ranges submenu and created it in the PRISM Setup menu.
- 2 Occurrences.** This column indicates the amount of time the acquired data was within each range.
- 3 %.** This column shows the number of occurrences, expressed as a percentage of total time. You can adjust the sample size to include or exclude data outside of the defined ranges with the total time field.
- 4 Range.** This column displays the name of the ranges that you defined in the Define Ranges submenu.
- 5 Bar Chart.** The bar chart shows the percentage of occurrences that fell within the range; this is a graph of the data in the % column. This value may vary with the total time field (excluding or including).
- 6 Total time outside ranges.** This figure indicates the total time spent outside of the defined ranges. This figure is used in the percentage calculations when you include the activity spent outside of the ranges.



## **Section 5: COUNT - REAL TIME OVERVIEW**

Count - Real Time Overview displays the execution activity of your system under test in real time. You look at the system activity as the data is acquired; data is processed in the background. You get to see all acquisition samples, so you won't miss infrequent or intermittent events.

Count - Real Time Overview measures the system under test using counters. First, you define up to 12 ranges, consisting of address channel groups, and PA assigns a counter to each range. During acquisition, PA increments a counter whenever the acquired data falls within its associated range. The Count - Real Time Overview menu dynamically displays the count for the ranges in a bar chart and table. It also displays the total count for all of the ranges. As you acquire more samples in real time, the new data is combined with the existing results.

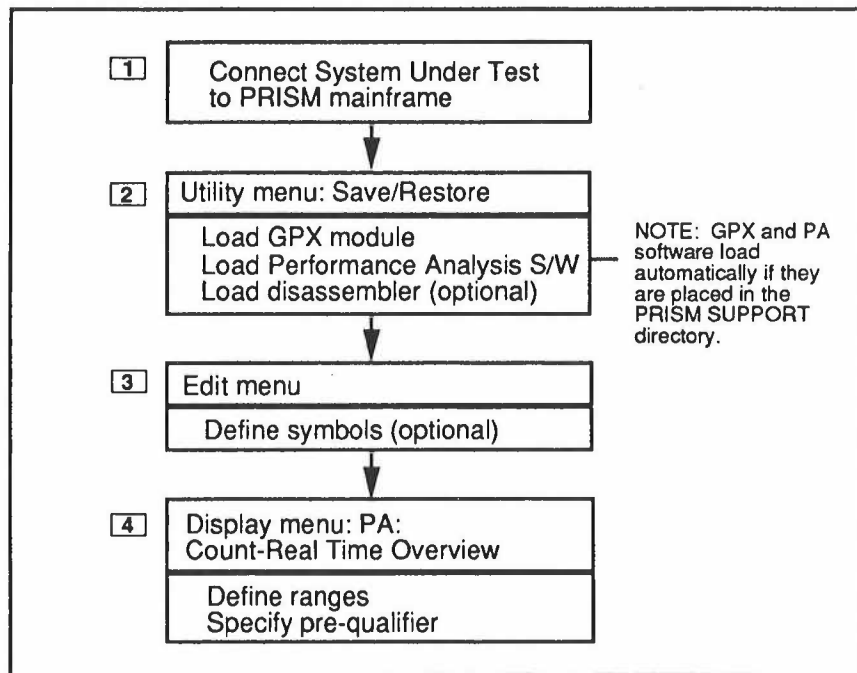
Count - Real Time Overview does not use the PRISM trigger setup, but lets you define a word-recognizer condition to pre-qualify data presented to the defined ranges. The total count displayed in the menu includes all samples presented to the word-recognizer qualifier.

### **USES OF COUNT - REAL TIME OVERVIEW**

You use Count - Real Time Overview when you want to directly measure the performance characteristics of your code as it is handled by the application module. This lets you see an accurate representation of overall system activity. Since you are observing the system in real time, you can measure interrupts that may be difficult to detect using PA's other menus.

### **SETTING UP COUNT - REAL TIME OVERVIEW**

Figure 5-1 shows the steps involved in setting up Count - Real Time Overview. Notice that unlike State Overview and Single Event, you do not create a trigger setup in the PRISM Setup menu. Steps 1-3 are described in more detail in Section 2 and step 4 is described in more detail in the remainder of this section.



**Figure 5-1. Count - Real Time Overview setup steps.**

- 1 Connect to your system under test.** Connect the PRISM system to your system under test with a probe and probe adapter. For details on making your connections, refer to the *32GPX Acquisition Module User Manual* and your microprocessor support instruction manual.
- 2 Load software.** You must load the 32GPX and GPX\_PA software for Count - Real Time Overview to work; separate GPX\_PA software should be loaded for each GPX module. You can also load a disassembler; this simplifies setup, since the disassembler automatically defines clocking, grouping, and symbols. The PA and GPX software load automatically if you place them in the SUPPORT directory.
- 3 Define symbols.** You have the option of using the Edit menu to assign meaningful names to range bounds. You can then use these symbols in other setup steps, thereby simplifying these tasks. Application software and disassemblers automatically define some symbols. For details on defining symbols, refer to the *PRISM System User Manual*.



- [4] Define ranges in Count - Real Time Overview.** In PA's Count - Real Time Overview menu, you set up the ranges that you want to study (in the Define Ranges submenu), then start your acquisition, and display the resulting execution activity for the ranges.

## Defining Ranges

Count - Real Time Overview counts the occurrences of user-defined conditions in sections of code. You use the Define Ranges submenu to define these sections of code, or ranges, for the channel groups. This allows you to organize PA's results into meaningful information.

State Overview and Real Time Overview share range definitions. When you modify range definitions in one menu, a new set of range definitions is created in the other menus. Since Real Time Overview and State Overview support a different number of ranges, Real Time Overview uses only the first 12 of the ranges defined in State Overview.

Since Count - Real Time Overview does not use the PRISM trigger setup, the Define Ranges submenu lets you define a word-recognizer qualifier condition that lets you pre-qualify data presented to the defined ranges. If the condition is satisfied, then Count - Real Time Overview accepts the data. This feature is not available for 160-channel modules (using two GPX modules).

Follow these steps to display the Define Ranges submenu:

1. Display PA by pressing the Dspl key and then selecting the Performance Analysis application for the desired module in the DISPLAY field.
2. Select Count - Real Time Overview in the **Configured for** field.
3. Press F5: Define Ranges to display the Define Ranges submenu. (Refer to Figure 5-2 for an example of the Define Ranges submenu.)

### NOTE

*To access this submenu, you must define a valid range address group.*

DISPLAY: GPX1: PERFORMANCE ANALYSIS

Configured for: Count - Real Time Overview

Group Name: Address Start All GPX Modules: No

---

Define Ranges

1 Group Name: Address

2 Accept Samples When Word =

3 Bounds Radix: RANGE

BOUNDS	RANGE NAME
read_bndries	Range 0
read_direct_from_lpu	Range 1
read_even_buffer	Range 2
read_from_lpu	Range 3
read_small	Range 4
read_word	Range 5
write_to_lpu	Range 6
write_word	Range 7
ExCommand	Range 8
ExGetAcknowledge	Range 9

F1 Undo All Changes F2 Add Range F3 Delete Range F4 Set to Defaults F5 Change Radix F7 Auto Scale F8 Exit Submenu

Figure 5-2. Define Ranges submenu in Count - Real Time Overview.

- 1 **Group Name.** Use this field to select the name of the group whose ranges you need to enter. You can select from range groups that you set up in the 32GPX Setup menu's Channel Grouping submenu or from those automatically created when you load a disassembler. There are restrictions on the address groups that PA will use (see Section 2 for these restrictions).
- 2 **Accept Samples When Word.** This field shows the test used to pre-qualify data. The test consists of a condition and a word-recognizer qualifier. The condition choices are equal (=) or not equal (!=). You change the format of the word recognizers with the Change Radix function key.
- 3 **Bounds Radix.** You can select from a list of possible formats for the range bounds. Your choices are Hexadecimal, Octal, Binary, Pattern, and Range. If you want to use values that you defined with the Symbol Editor, use the Pattern or Range radix. To add a user-defined offset to ranges with symbolic radices, use the Base Offset field in the Symbol Definition Edit menu.

- [4] Bounds, Range Name.** These fields show the minimum and maximum values that define a range. Figure 5-2 uses the Range radix to define the range bounds with symbols. The range symbol in the Bounds field contains the lower and upper bounds. The default range names are numbered, starting with zero. You can use these defaults or specify your own names. Use the CURSOR keys to scroll to ranges that do not fit on the display.

### Function Keys

- F1: Undo All Changes.** This key erases all changes made since displaying the Define Ranges submenu. It returns the menu to the original settings that existed when you entered the menu.
- F2: Add Range.** This key adds a range to your group. The maximum number of ranges in Count - Real Time Overview is 12.
- F3: Delete Range.** This key removes the selected range from the group.
- F4: Set to Defaults.** This key defines one range with the lower bound set to the lowest possible value and the upper bound set to the highest possible value. These defaults are defined by the system, and cannot be changed.
- F5: Change Radix.** This key changes the radix of the selected channel group within the word-recognizer field. Therefore, this affects the format of the word recognizer for that group.
- F7: Auto Scale.** This key lets you quickly set up ranges. The upper bound of the range becomes the largest upper bound of the group, and the other bounds are scaled to fit. Count - Real Time Overview automatically defines 12 ranges, you cannot set this parameter. For details on the auto-scale feature, refer to the *Auto Scaling Ranges* in Section 3.
- F8: Exit Submenu.** This key exits the Define Ranges submenu and displays the Count - Real Time Overview menu.

## MAKING AN ACQUISITION

After you finish the setup tasks, you are ready to make your data acquisition.

If you have multiple GPX modules, you can synchronize data acquisition between these modules with the Start All GPX Modules switch. This feature ensures that the sampling for each module starts at exactly the same time. When you start or continue sampling for the displayed module, the synchronized module(s) will also start or continue sampling. You can control sampling from any module. Synchronized modules must operate in compatible sampling configurations (statistical versus real time); State Overview is compatible with Single Event, and Time - Real Time Overview is compatible with Count - Real Time Overview. This field does not appear on the menu if you have only one GPX module.

Figure 5-3 shows the keys and fields that control data acquisition and data display in the Count - Real Time Overview menu. You can change these settings before, during, or after your acquisition.

### NOTE

*In Real Time Overview, all of the modules in the system are temporarily disabled, except modules included in multiple-module PA sampling. These disabled modules do not participate in the acquisition. This is not true for PA's other menus, Single Event and State Overview.*

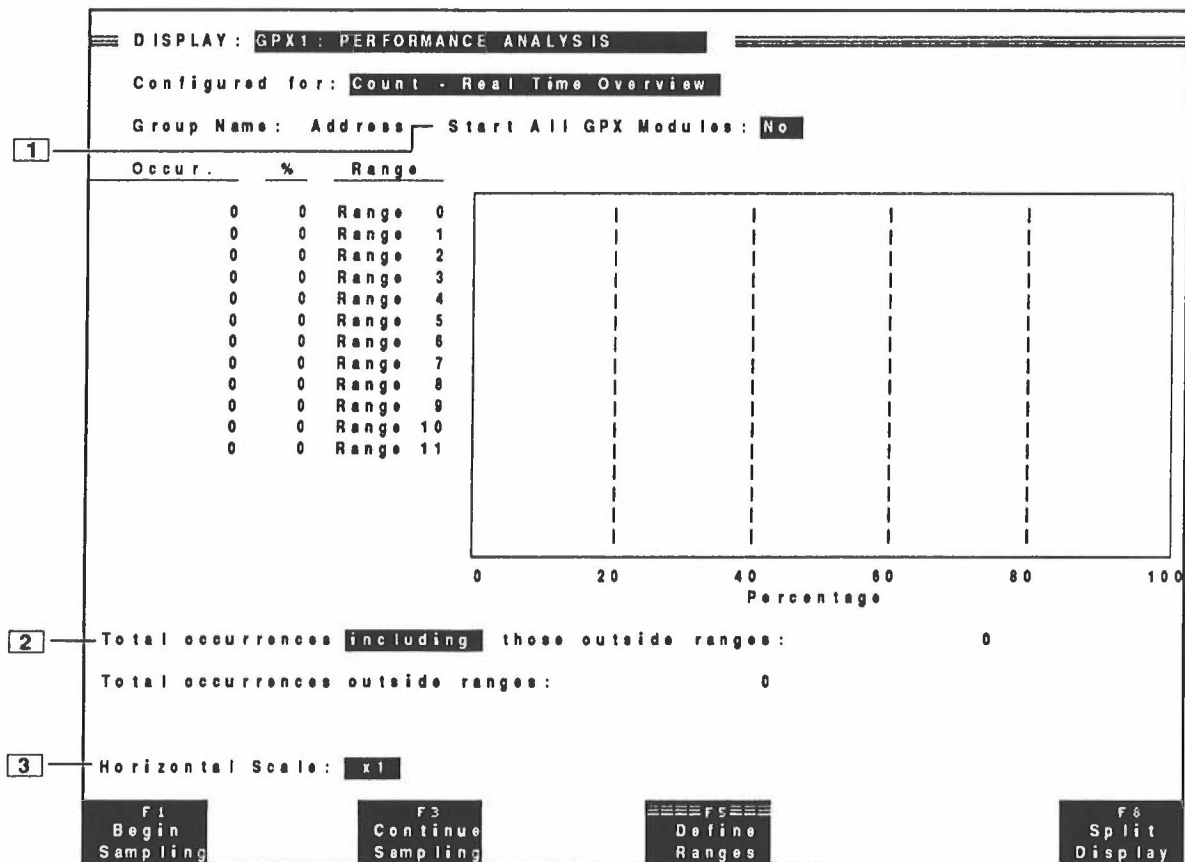


Figure 5-3. Count - Real Time Overview's acquisition-related fields and keys.

- 1 **Start All GPX Modules.** This field synchronizes the sampling of all GPX modules.
- 2 **Total occurrences.** If you select **including** in this field, all of the data, including the data outside of the defined range, is calculated into the overall percentages. If you select **excluding**, only the data acquired within the defined ranges is counted in the percentage calculation.
- 3 **Horizontal Scale.** This field adjusts the scale of the bar chart's horizontal axis by a defined factor (x1, x2, x5, x10, or x20).

### Function Keys

- F1: Begin Sampling.** Press this key to begin sampling. This initializes all data and counters. To stop sampling, press it again.
- F3: Continue Sampling.** This key lets you sample on a cumulative basis. Newly acquired data is added to your existing data; existing data is not destroyed.

**F5: Define Ranges.** This key displays the Define Ranges submenu.

**F8: Split Display.** This key splits the window horizontally into two panes, so you can view two menus. After displaying two panes, press Shift-F8 to switch which pane is active or press F8 again to display a single pane.

## ANALYZING THE RESULTS

As you acquire data, Count - Real Time Overview displays the range activity dynamically. Data is continually redisplayed. Figure 5-4 shows the system-activity information that appears on a Count - Real Time Overview menu.

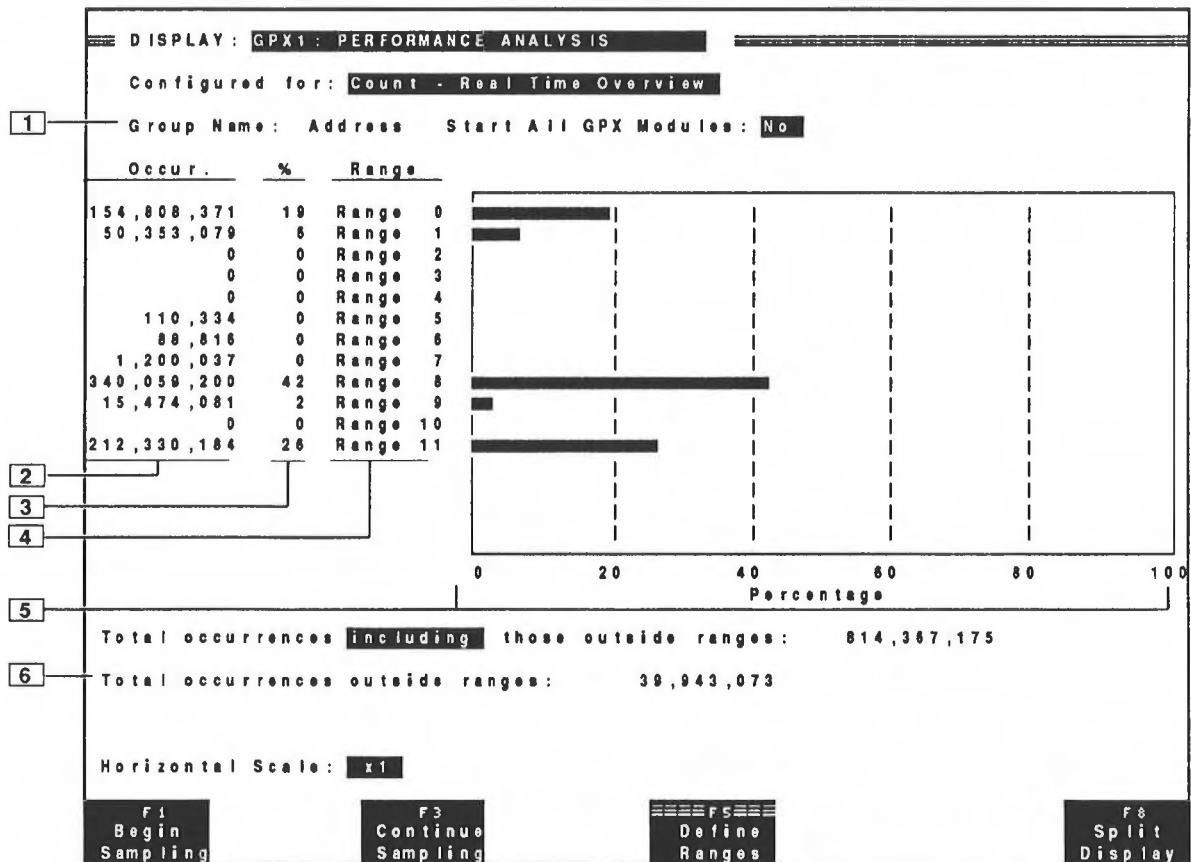


Figure 5-4. Count - Real Time Overview results.

- [1] Group Name.** This field shows the group name (for example, address) of the displayed performance statistics. You selected the group in the Define Ranges submenu and created it in the PRISM Setup menu.
- [2] Occurrences.** This column indicates the number of times the acquired data was within each range.
- [3] %.** This column shows the number of occurrences, expressed as a percentage of total counts. You can adjust the sample size to include or exclude data outside of the defined ranges with the total occurrences field.
- [4] Range.** This column displays the name of the ranges that you defined in the Define Ranges submenu.
- [5] Bar Chart.** The bar chart shows the percentage of occurrences that fell within the range; this is a graph of the data in the % column. This value may vary with the total occurrences field (excluding or including).
- [6] Total occurrences outside ranges.** This figure indicates the total occurrences spent outside of the defined ranges. This figure is used in the percentage calculations when you include the activity spent outside of the ranges.





## Section 6: SINGLE EVENT

Single Event is similar to State Overview in that they are both statistical PAs, but you use Single Event to study specific events. Single Event repeatedly acquires and processes data using the following batch technique:

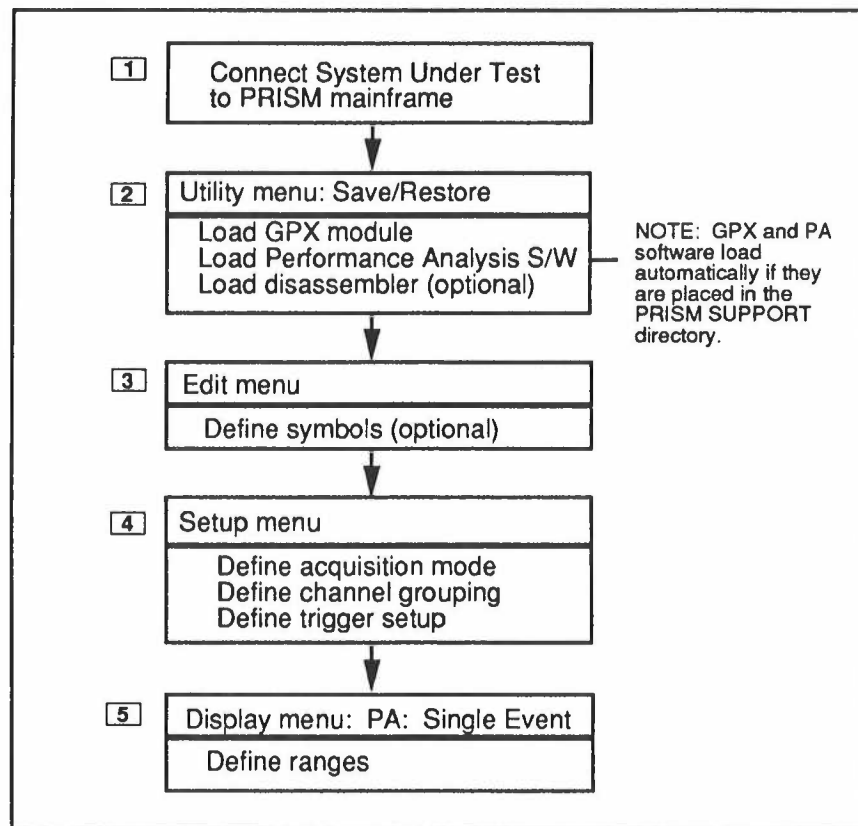
1. The PRISM system tests the data to ensure that it passes the tests that you defined in the trigger setup.
2. Upon finding valid data, the PRISM system fills the acquisition memory.
3. Single Event processes this data. Each time execution occurs within a range of address lines that you defined, PA increments the counter or measures the execution time for that range. Single Event adds the new results to any existing data.
4. The Single Event menu displays time or count-based statistics on software events in your system under test. The results report the average activity for all acquisition samples, as well as the minimum and maximum values.

### USES OF SINGLE EVENT

You will usually use Single Event after you have learned something about your system under test from PA's other menus. You use counters and timers to study the activity of a specific event. For example, you could study the occurrences of a subroutine or the duration of a wait loop. You could also use Single Event to compare the duration of separate events.

### SETTING UP SINGLE EVENT

Figure 6-1 shows the steps involved in setting up Single Event. Steps 1-4 are discussed in more detail in Section 2 and step 5 is discussed in more detail in the remainder of this section.



**Figure 6-1. Single Event setup steps.**

- 1 Connect to your system under test.** You connect the PRISM system to your system under test with a probe and probe adapter. For details on making your connections, refer to the *32GPX Acquisition Module User Manual* and your microprocessor support instruction manual.
- 2 Load the required software.** You must load the GPX and GPX\_PA software for the PRISM system to work; separate GPX\_PA software should be loaded for each module. You can also load a disassembler; this simplifies setup, since the disassembler automatically defines clocking, grouping, symbols, and triggering. The PA and GPX software load automatically if you place them in the SUPPORT directory.

- 3 **Define symbols.** You have the option of using the Edit menu to assign meaningful names to range bounds or word recognizers used in trigger specifications. You can then use these symbols in other setup steps, thereby simplifying these tasks. Application software and disassemblers automatically define some symbols. For details on defining symbols, refer to the *PRISM System User Manual*.
- 4 **Set up the GPX.** In the Setup menu, you program the GPX to trigger on the software event you want to analyze. You must define a counter or timer in the trigger setup to gather data in Single Event.
- 5 **Define ranges in Single Event.** In PA's Single Event, you set up the ranges for the timer/counter data in the Define Ranges submenu, start the acquisition, and display the data.

## Defining Ranges

Single Event measures the execution time or occurrences of an event. Since Single Event is based on either a timer or a counter, the ranges you define are in units of time or count. For example, a timer's ranges represent the length of time it takes for an event to occur, such as 50-100 ms, 100-150 ms, and so on. A counter's ranges represent the number of times an event occurs, such as 0-5 times, 5-10 times, and so on.

You use the Define Ranges submenu to define these ranges. This allows you to organize PA's results into meaningful information. Follow these steps to display the Define Ranges submenu:

1. Display PA by pressing the Dspl key and then selecting the Performance Analysis application for the desired module in the DISPLAY field.
2. If the Single Event menu is not displayed, select Single Event in the **Configured for** field.
3. Press F5: Define Ranges to display the Define Ranges submenu.

As shown in Figure 6-2, the Define Ranges submenu lets you select either a counter or a timer that is defined in the trigger specification. When you change the selection from counter to timer, the range bounds change by a factor of 10.

**NOTE**

*You must define at least one counter or timer in the Setup menu, before you define any ranges in the Define Ranges submenu.*

DISPLAY: GPX1: PERFORMANCE ANALYSIS

Configured for: Single Event

Analyzing Counter 0 Start All GPX Modules: No

Define Ranges

1 Analyze Counter 0 Number of Ranges to be Auto Scaled: 16

2

LOWER BOUND		RANGE NAME		UPPER BOUND
000,000,000,000,000	<=	Range 0	<=	000,000,000,001,023
000,000,000,001,024	<=	Range 1	<=	000,000,000,002,047
000,000,000,002,048	<=	Range 2	<=	000,000,000,003,071
000,000,000,003,072	<=	Range 3	<=	000,000,000,004,095
000,000,000,004,096	<=	Range 4	<=	000,000,000,005,119
000,000,000,005,120	<=	Range 5	<=	000,000,000,006,143
000,000,000,006,144	<=	Range 6	<=	000,000,000,007,167
000,000,000,007,168	<=	Range 7	<=	000,000,000,008,191
000,000,000,008,192	<=	Range 8	<=	000,000,000,009,215
000,000,000,009,216	<=	Range 9	<=	000,000,000,010,239

3

F1 Undo All Changes F2 Add Range F3 Delete Range F4 Set to Defaults F7 Auto Scale F8 Exit Submenu

**Figure 6-2. Define Ranges submenu in Single Event.**

- 1 **Analyze.** This field lets you select either a timer or counter that you defined in the trigger setup.
- 2 **Number of Ranges to be Auto Scaled.** Auto scaling is a quick method of defining ranges. This field lets you choose the number of ranges to be auto scaled. The options are 1, 2, 4, 8, or 16.
- 3 **Lower Bound, Range Name, Upper Bound.** These fields show the minimum and maximum values that define a range. Default range names are numbered, starting with zero, but you can change these range names in this menu. The Range radix displays a range name and one bounds field. Use the CURSOR keys to scroll to ranges that do not fit on the display.

### Function Keys

- F1: Undo All Changes.** This key erases all changes made since displaying the Define Ranges submenu. It returns the menu to the original settings that existed when you entered the menu.
- F2: Add Range.** This key adds a range to your group. The maximum number of ranges in Single Event is 16.
- F3: Delete Range.** This key removes a selected range from the group.
- F4: Set to Defaults.** This key defines one range with the lower bound set to the lowest possible value and the upper bound set to the highest possible value.
- F7: Auto Scale.** This key lets you quickly set up ranges. The upper bound of the range becomes the largest upper bound of the counter or timer, and all of the other bounds are scaled to fit. (For more information on Auto Scale, refer to *Auto Scaling Ranges* in Section 3.)
- F8: Exit Submenu.** This key exits the Define Ranges submenu and displays the Single Event menu.

## MAKING AN ACQUISITION

After you set up Single Event, you are ready to make your data acquisition.

If you have multiple GPX modules, you can synchronize data acquisition between these modules with the Start All GPX Modules switch. This feature ensures that the sampling for each module starts at exactly the same time. When you start or continue sampling for the displayed module, the synchronized module(s) will also start or continue sampling. You can control sampling from any module. Synchronized modules must operate in compatible sampling configurations (statistical versus real time); State Overview is compatible with Single Event, and the Real Time menus are compatible with each other. This field does not appear on the menu if you have only one GPX module.

Figure 6-3 shows the two keys that control data acquisition: Begin Sampling and Continue Sampling. Both of these keys result in the GPX module filling PA acquisition memory, but Begin Sampling initializes existing results first. Figure 6-3 also shows two fields, Sample Size and Horizontal Scale, that let you adjust how Single Event displays the statistics. You can change these settings before, during, or after your acquisition.

## Single Event

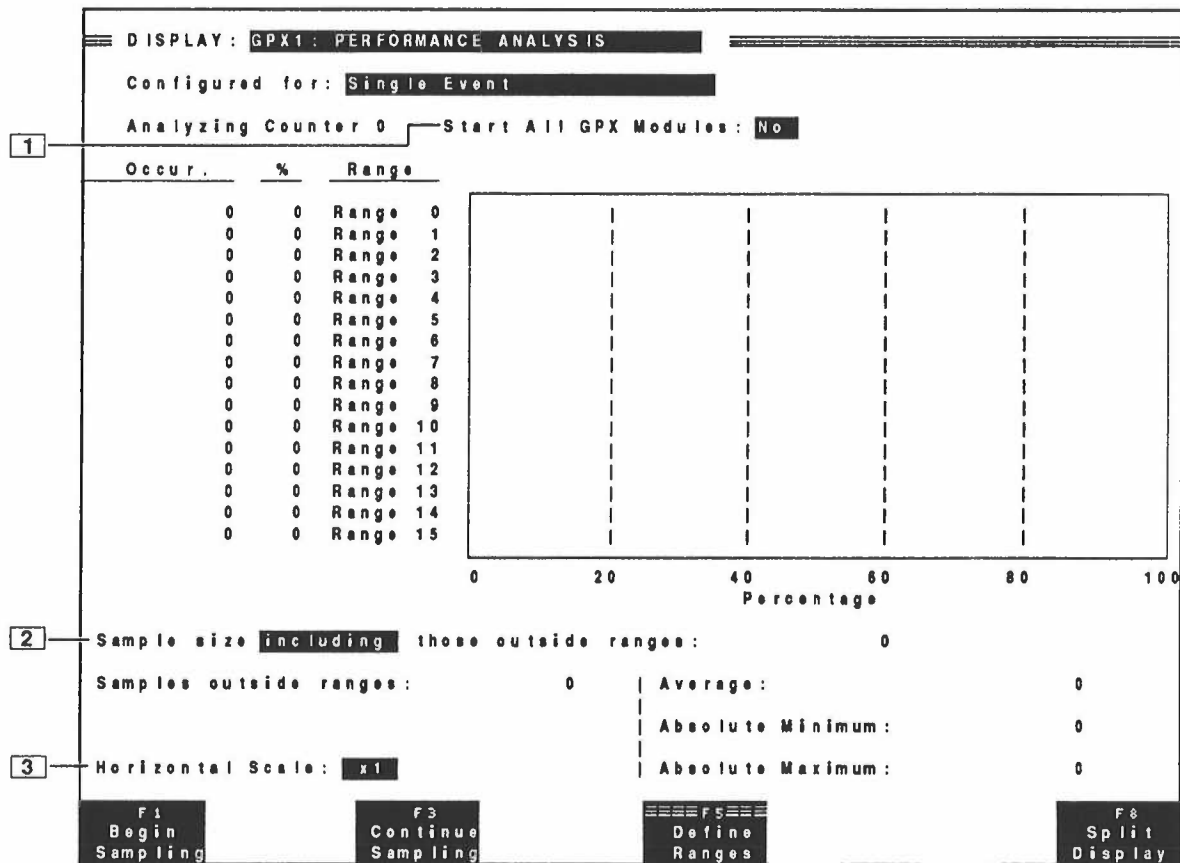


Figure 6-3. Single Event acquisition-related fields and keys.

- [1] **Start All GPX Modules.** This field synchronizes the sampling of all GPX modules.
- [2] **Sample size.** If you select **including** in this field, all of the data, including the data outside of the defined range, is calculated into the overall percentages. If you select **excluding**, only the data acquired within the defined ranges is calculated into the percentages.
- [3] **Horizontal Scale.** This field adjusts the scale of the bar chart's horizontal axis by a defined factor (x1, x2, x5, x10, or x20).

### Function Keys

**F1: Begin Sampling.** Press this key to begin sampling. This initializes all data, counters, and timers. To stop sampling, press it again.

**F3: Continue Sampling.** This key lets you sample on a cumulative basis. Newly acquired data is added to your existing data; the existing data is not destroyed.

**F5: Define Ranges.** This key displays the Define Ranges submenu.

**F8: Split Display.** This key splits the window horizontally into two panes, so you can view two menus. After displaying two panes, press Shift-F8 to switch which pane is active or press F8 again to display a single pane.

## ANALYZING THE RESULTS

After you make your acquisition, PA displays a Single Event screen with tabular and graphical statistics about the measured software event. Figure 6-4 shows an example of the Single Event display.

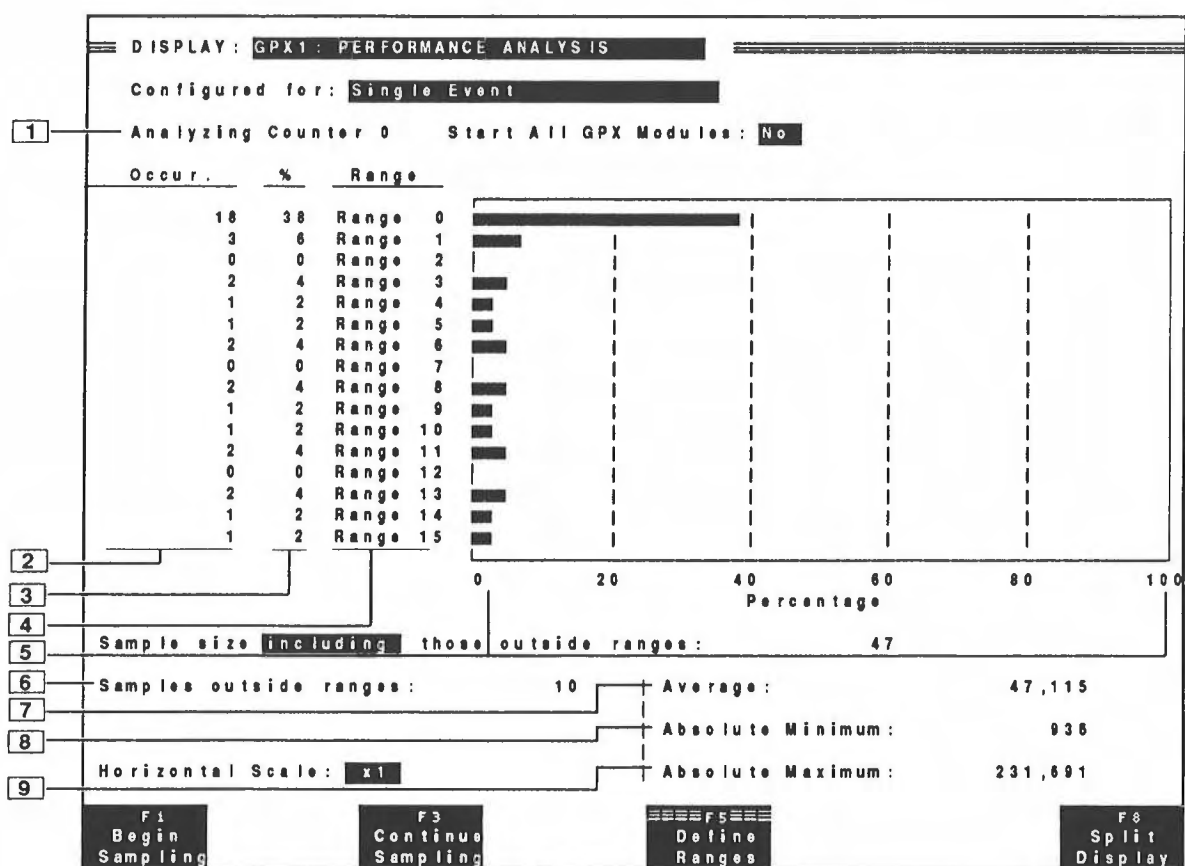


Figure 6-4. The Single Event results.

- [1] **Analyzing Counter/Timer.** This field shows the name of either the counter or timer of the displayed performance statistics. You selected the counter or timer in the Define Ranges submenu and defined it in the Setup menu's trigger setup.
- [2] **Occurrences.** This column indicates the number of times the event fell within each counter/timer range.
- [3] **%.** This column shows the number of occurrences, expressed as a percentage of total samples. You can adjust the sample size to include or exclude data outside of the defined ranges with the sample size field.
- [4] **Range.** This column displays the name of the ranges that you defined in the Define Ranges submenu.
- [5] **Bar Chart.** The bar chart shows the percentage of occurrences that fell within the range; this is a graph of the data in the % column. This value may vary with the sample size field (excluding or including).
- [6] **Samples outside ranges.** This figure indicates the number of samples that fell outside the defined ranges. This figure is used in percentage calculations when you include samples outside of the ranges.
- [7] **Average.** Displays the average time or count of all data samples.
- [8] **Absolute Minimum.** Displays the smallest data sample (the fewest number of occurrences for a counter or the shortest amount of time for a timer).
- [9] **Absolute Maximum.** Displays the largest data sample (the most occurrences for a counter or the longest amount of time for a timer).



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## **MANUAL CHANGE INFORMATION**

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.



# **Release Note**

**Tektronix**

## **PRISM 32PA Performance Analysis**

**061-3916-00**

**Product Name:** Performance Analysis  
**Product Line:** PRISM Logic Analyzers  
**Nomenclature:** 32PA  
**Version:** V1.0

## **VERSION DIFFERENCES AND ENHANCEMENTS**

No previous release.

## **INSTALLATION NOTES**

To use this version of 32PA software, your PRISM system must be equipped as follows:

- 32GPX hardware and software, installed
- PRISM System Software Version 3.0, or later

## **OPERATIONAL NOTES**

The following notes describe functions associated with this version of software that can affect how you use the product. The listed functions are high-impact or frequently-seen problems. You should keep these release notes in the Change Information section following the yellow divider page at the rear of the manual.

### **Unconnected Signal Leads**

If you are not using all the 32GPX channels, you should either leave all signal leads connected to the system under test or you should use the GPX Channel Grouping submenu to delete the unconnected channels. Failure to follow one of these alternatives can cause PA to produce confusing data, because all unconnected channels are interpreted as true, regardless of channel masking.

### **Virtual Slots**

You should always load the Performance Analysis (PA) software to an installed 32GPX Acquisition Module. Although it is possible to load the PA software to a virtual slot, you should avoid doing so. Operating PA when it is loaded to a virtual slot can result in an irrecoverable system error.

When you load an instrument setup that was made with more application modules than are currently installed in your instrument, the PRISM creates a "virtual slot" to load the software into. (This allows you to view Refmems, even if your mainframe is not configured with the appropriate module.)

In the System Configuration menu, virtual slots are differentiated from actual hardware modules by a V next to the module name.

For more information about virtual slots, refer to Section 6 of your system user manual.